



Life Cycle Plan (LCP)

CS577a

Fall 2002

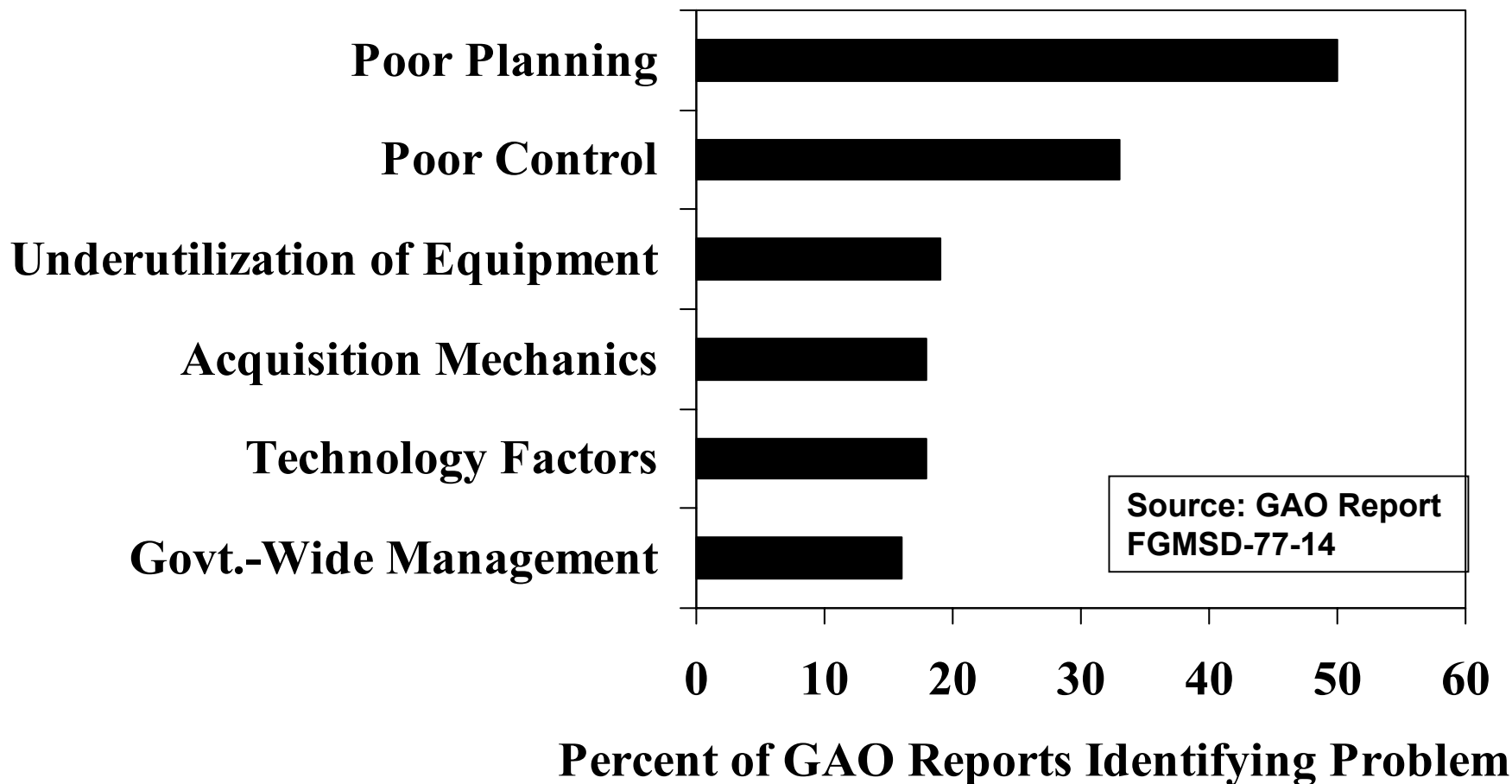


Outline

Software Planning Guidelines

- **Motivation**
- **Software Project Plans**
 - **General Outline**
 - **Content of Sections**

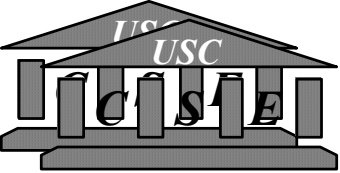
Problems With Computer System Acquisition and Use in U.S. Government, 1965-1976



Project Plans May Look Complicated, But They Aren't!

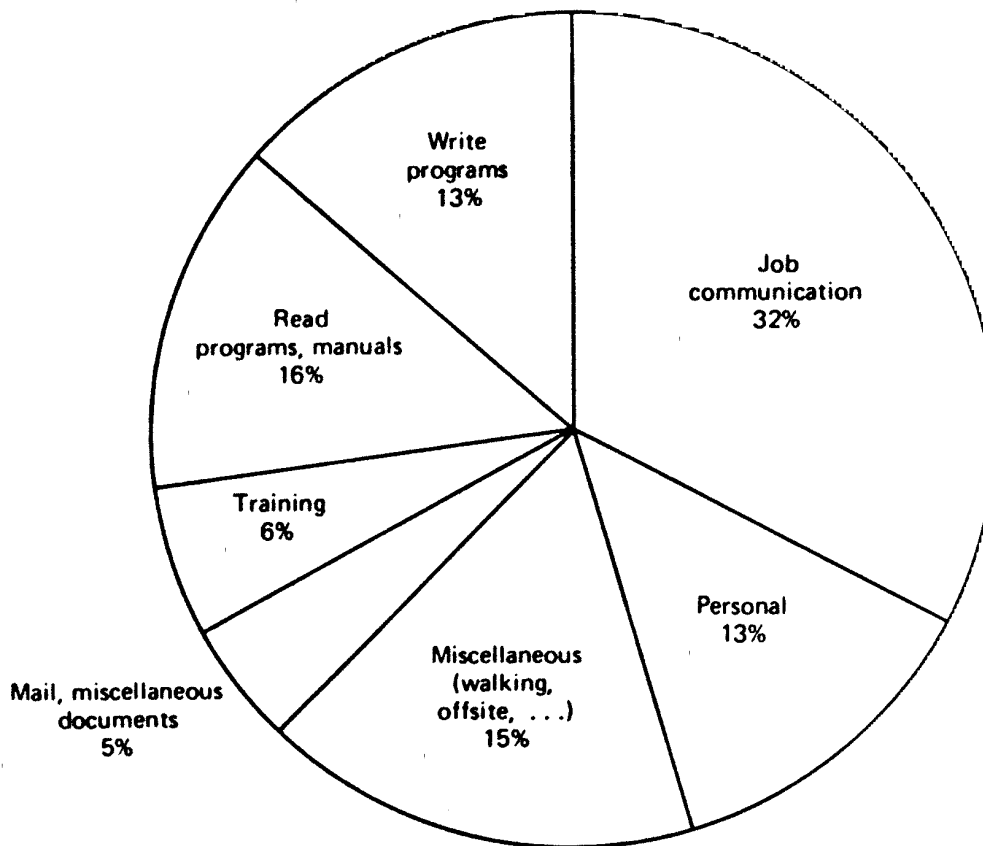
•Just Answer the Simple Questions:

- Why? _____ Objectives
- What? > Milestones & Products
- When? > Milestones & Products
- Who? > Responsibilities
- Where? > Responsibilities
- How? _____ Approach
- How Much? _____ Resources
- Whereas? _____ Assumptions



Objectives of Software Development

- **Deliver a computer program?**
- **Deliver a correct computer program?**
- **Deliver a correct, maintainable computer program?**
- **Make winners of key stakeholders**
 - Operators: procedures, facility preparation
 - Users, Operators, Maintainers: data conversion, training, transition procedures, support capabilities



ACTIVITY	List, Cards, Worksheet	Business	Personal	Meeting	Training	Mail/Misc. Documents	Technical Manuals	Oper. Proc. Misc.	Program Test	Totals
Talk or listen	4%	17%	7%	3%				1%		32%
Talk with manager		1								1%
Telephone		2	1							3%
Read	14					2	2			18%
Write/recording	13					1				14%
Away or out		4	1	4	6					15%
Walking	2	2	1			1				6%
Miscellaneous	2	3	3			1		1	1	11%
Totals	35%	29%	13%	7%	6%	5%	2%	2%	1%	100%

FIGURE 22-4 What do programmers do?

COCOMO II PM Estimates and CS 577 Rough Team Size (for risk assessment, not precise planning)

1 CS 577 Team Member $\sim =$ 2 COCOMO II Person Months
(“EST-Most Likely” from display)

1 CS 577 TM $\sim =$ (12 weeks)(12 project hours/week) $\sim =$ 144 proj-hr

2 COCOMO II PM $\sim =$ (2)(152 hr/PM)(.66project hr/total hr)*(.72 in CS 577)** $\sim =$ 144 proj-hr

* .66 of day spent doing project work (see Figure)

** 72% of effort in Elaboration and Construction stage



LCP 1. Objectives (Why?)

1.1 Purpose

- Provide feasible management approach for meeting system goals
- Basis for Project Control
- Make Best Use of People, Resources
- Provide Evidence That Developers Know What They're Doing

1.1 Purpose of the Life Cycle Plan Document

- Describe the purpose of the document, and the intended audience
 - To serve as the basis for controlling the project's progress in achieving the software product objectives.
 - To help make the best use of people and resources throughout the development cycle.
 - To provide evidence that the developers have thought through the major development issues in advance (proactive development).

1.2 Assumptions

- **Conditions Necessary to Meet Plans**

- **Otherwise, Renegotiate**

- **Examples**

- **Requirements Stability**

- **Schedule Stability**

- **Continuity of Funding**

- **Customer-Furnished Items**

- **On-Schedule, Acceptable**

- **Customer Response Time on Approvals**

- **Other external dependencies (Hardware, COTS, other projects)**

1.3 References



2. Milestones and Products (What? When?)

- **Overall Life Cycle Strategy**
- **Detailed Schedule of Deliverables**
- **Detailed Milestones and Schedules**

2.1 Overall Life Cycle Strategy

- Describe overall approach:
 - Choice of process model(s) used and major life cycle stages, phases and milestones
 - Nature and phasing of the planned prototypes
 - Nature and phasing of the successive increments to be developed (if applicable)
 - Top-level milestone charts and activity networks showing the sequence of major products and activities.

Example LCP 2.1 Overall Life Cycle Strategy

From Hispanic Digital Archive LCP:

The proposed amount of flexibility. Therefore, we propose to use the evolutionary development as our software engineering process as suggested by the Process Model Decision Table. Further, we propose to use the WinWin Spiral Model as it is understood fairly well by the team members and system envisages a moderately understood set of requirements to be met with a low degree of robustness but with a high is supported by the Center for Software Engineering, University of Southern California. The schedules for project activities have been estimated using COCOMO II post-architecture model.

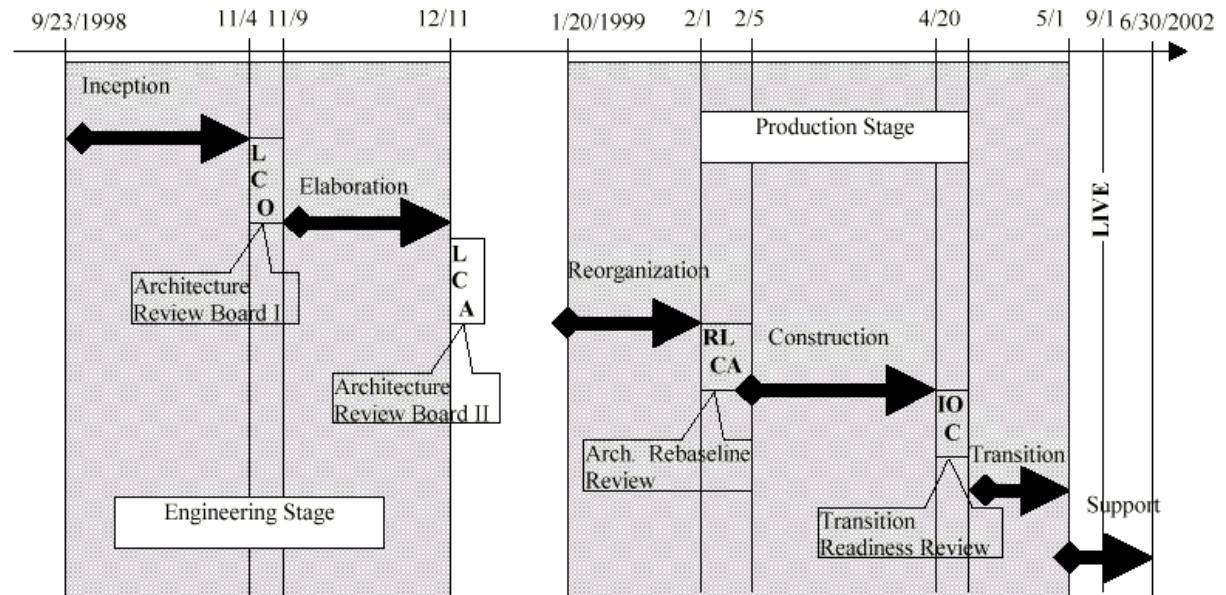
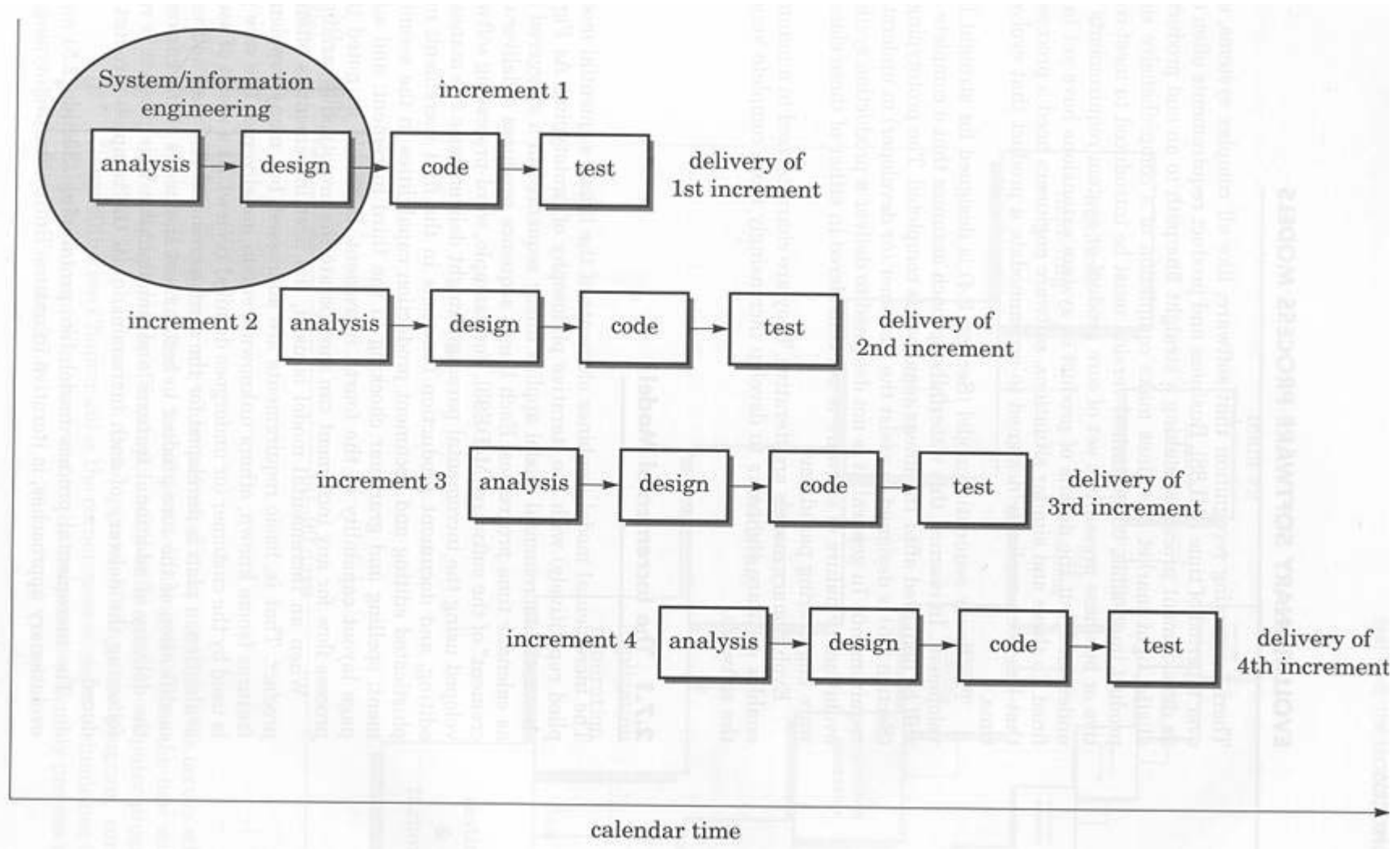


Figure 1 Life cycle phases and Milestones

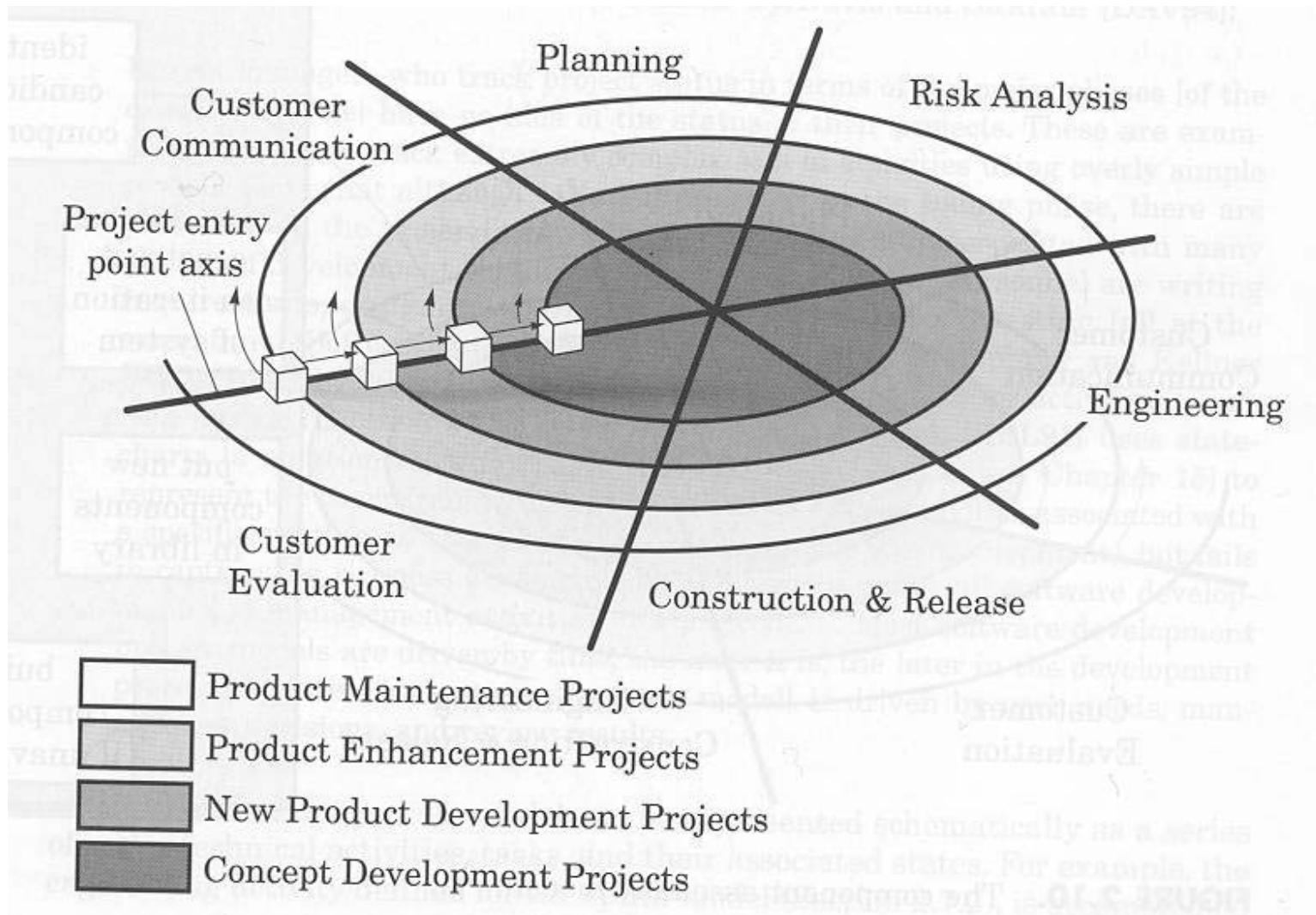
Process Model Decision Table

Objectives, Constraints			Alternatives		Model	Example
Growth Envelope	Understanding of Requirements	Robustness	Available Technology	Architecture Understanding		
Limited			COTS		Buy COTS	Simple Inventory Control
Limited			4GL, Transform		Transform or Evolutionary Development	Small Business - DP Application
Limited	Low	Low		Low	Evolutionary Prototype	Advanced Pattern Recognition
Limited to Large	High	High		High	Waterfall	Rebuild of old system
	Low	High			Risk Reduction followed by Waterfall	Complex Situation
		High		Low		Assessment High-performance Avionics
Limited to Medium	Low	Low-Medium		High	Evolutionary Development	Data Exploitation
Limited to Large			Large Reusable Components	Medium to High	Capabilities-to-Requirements	Electronic Publishing
Very Large		High			Risk Reduction & Waterfall	Air Traffic Control
Medium to Large	Low	Medium	Partial COTS	Low to Medium	Spiral	Software Support Environment

Incremental Model



Entire Life Cycle Model



Process model for CS 577

- Engineering Stage
 - Inception Phase (LCO)
 - WinWin Spiral cycle for LCO
 - **LCO Architecture Review Board review**
 - Elaboration Phase (LCA)
 - WinWin Spiral cycle
 - **LCA Architecture Review Board review**
- Production Stage
 - WinWin Spiral Cycle
 - Risk-driven Waterfall Cycle
 - **Transition Readiness Review**

Process model for CS 577 (continued)

- Transition Phase
 - **Release Readiness Review**
- Support Stage (Customer responsibility)
 - Release 1
 - **Release Readiness Review**
 - Release 2
 - **Release Readiness Review**
 - ...

2.2 Phase Milestones and Schedules

- Provide more detailed milestone charts and activity networks
- For each increment, indicate:
 - Completion of integration, of product test, and of acceptance test
 - Major dependencies on development activities, on other increments, on facilities, etc.;
 - Milestones showing the overall order in which components are integrated, and the intermediate stages of increment and acceptance testing.
 - How these are synchronized with milestones for preparation of test drivers, facilities, etc... for the various increments.

Management Checkpoints

Inception		Elaboration		Construction			Transition
Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7	

MAJOR MILESTONES



Lifecycle Objectives Milestone



Lifestyle Architecture Milestone



Initial Operational capability milestone



Product Release Milestone

Strategic focus on global concerns of the entire software project

Minor Milestones



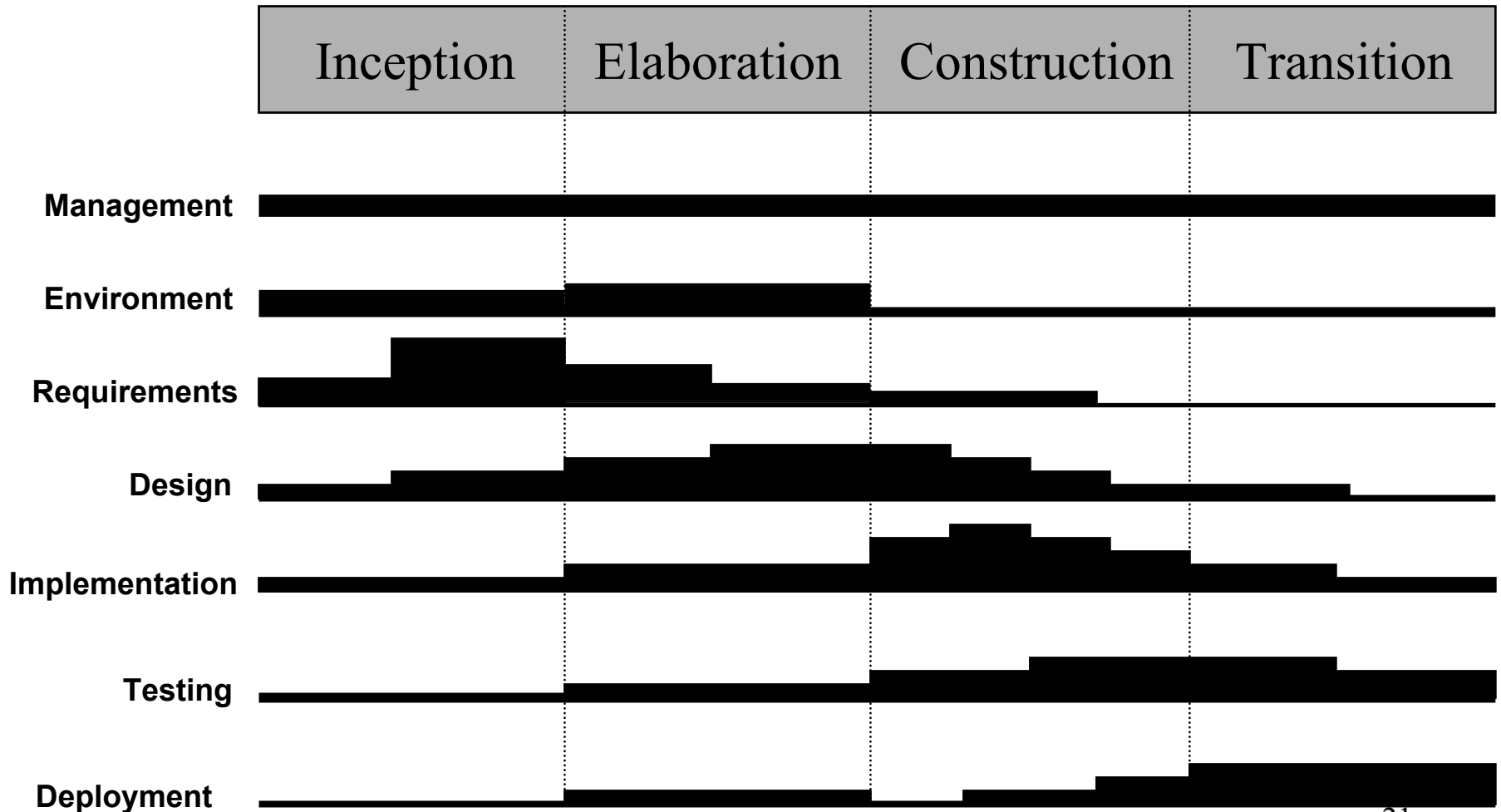
Tactical focus on local concerns of current iteration

Status Assessment

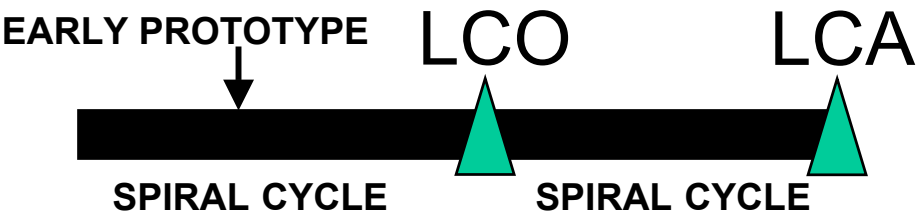
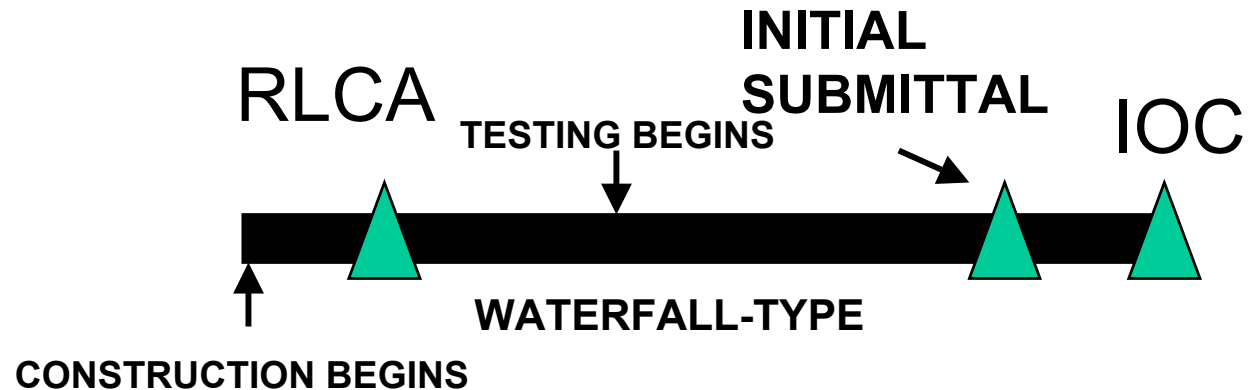


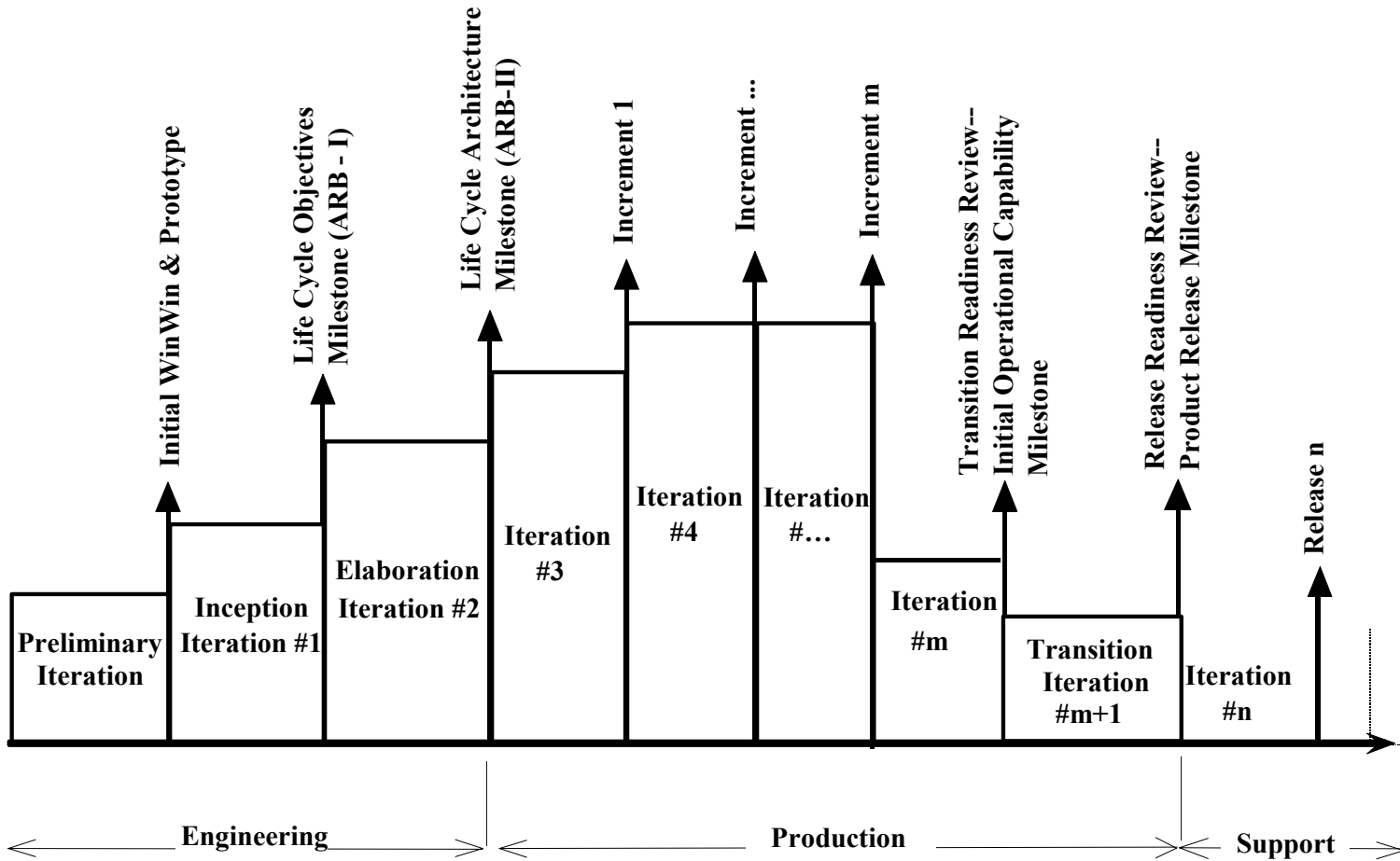
Periodic synchronization of stakeholder expectations

Workflow Balance over the Life Cycle



CS 577 Typical Software Process





Phases Milestones and Schedules

Measurable milestones

- Not “Get team thinking about GUI”
- But “Obtain team consensus & GUI”

Specific schedule dates

Gantt charts

- Calendar-oriented tasks lists
- Task dependencies optional

Activity networks/PERT charts

- Task dependencies explicit

Example Project Schedule

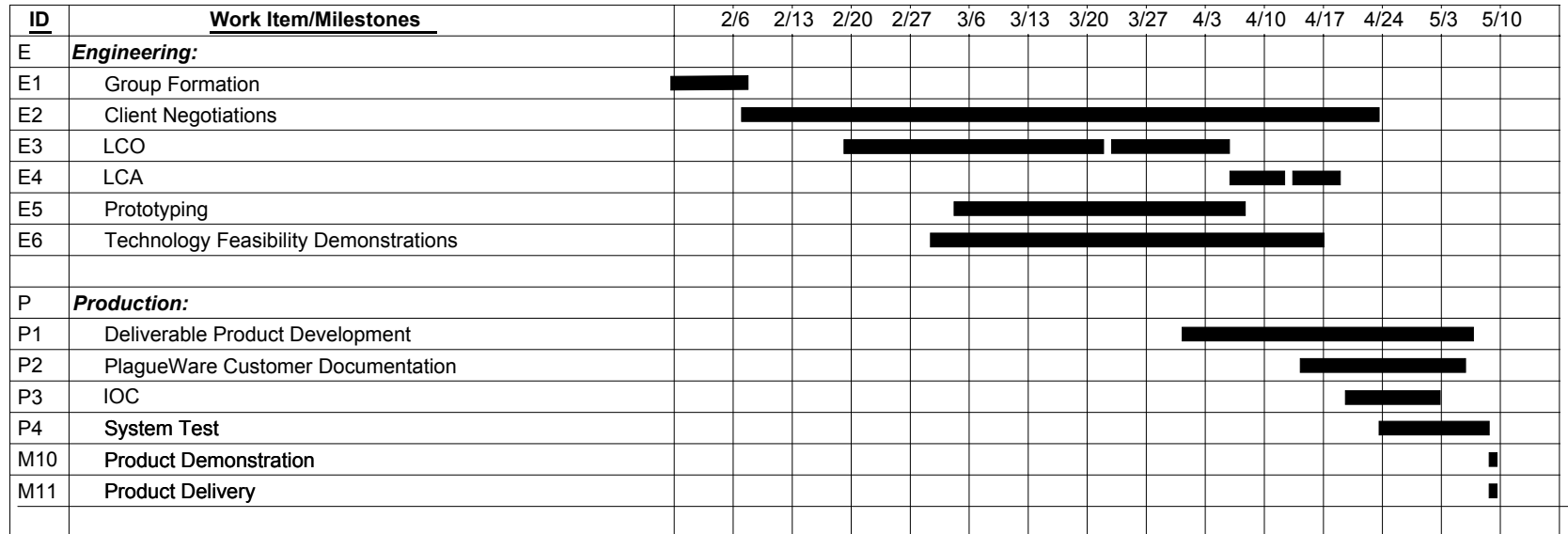
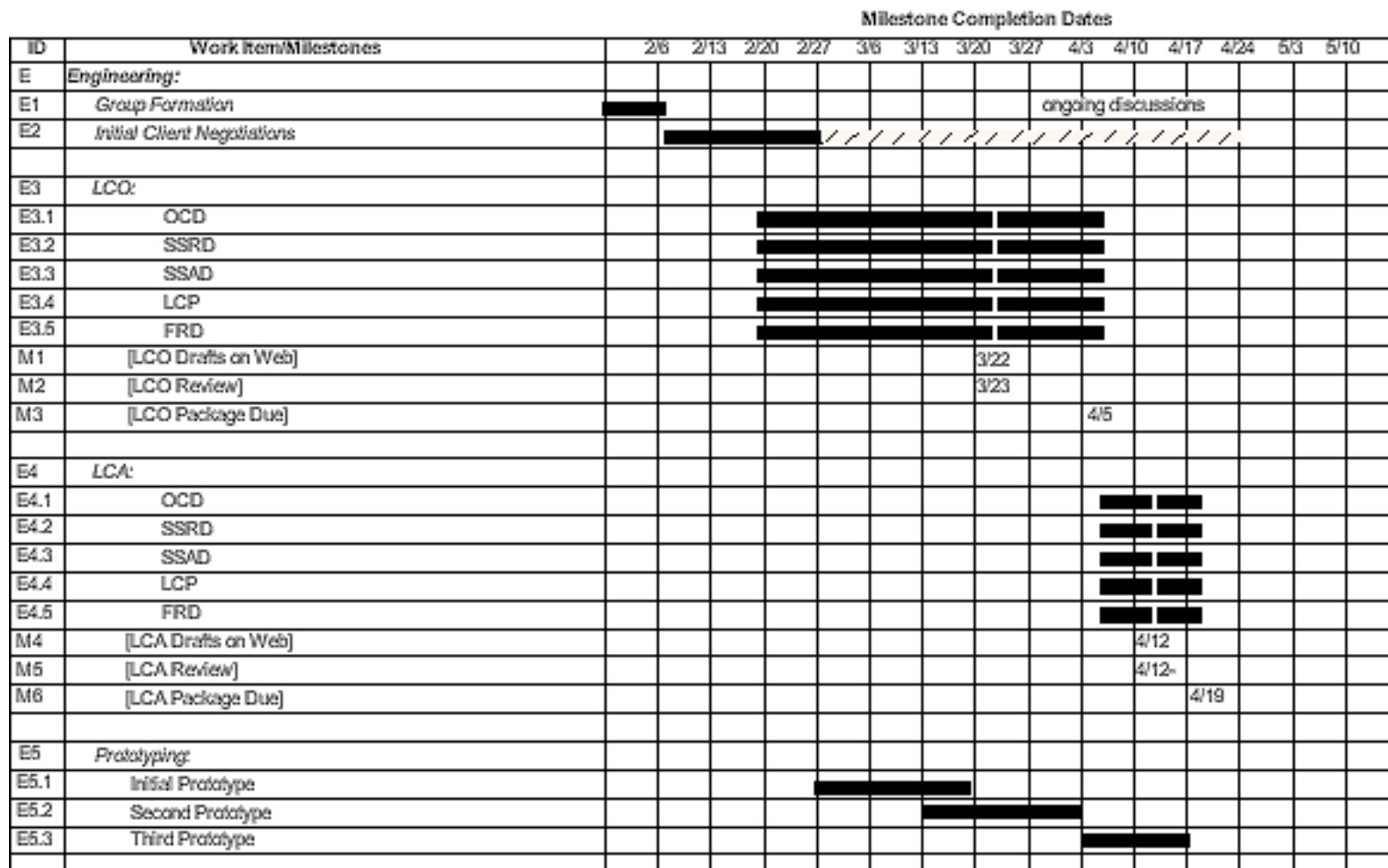


Figure . High Level PlagueWare Project Schedule

Example Detailed Schedule



2.3. Detailed Schedule of Deliverables

Deliverable Items

- Plans
- Specs
- Manuals
- Reports
- Code
- Data
- Equipment
- Facilities
- Training Materials
- Manhours, etc.

Nature of Deliverables

- Name or Title
- Date Due
- Required Format
- Completion Criteria
 - Produced, Delivered, Received, Reviewed, Tested, ---
- Pointers to Contract Requirements

Example 2.3 Phase Deliverables and Completion Criteria

Title	Delivery Date	Format	Completion Criteria
Life Cycle Objective Package	4/5/1999	Printed document	Receipt of document and ARB report signed by customer and developers
Life Cycle Architecture Package	4/19/1999	Printed documented + prototype software	Prototype acceptance document + ARB report
Initial Operational Capability	5/3/1999	Software + source code	Transition readiness review report

2.2.1 Inception Phase

During this phase initial understanding of the desired system must be accomplished. This is achieved by defining the scope of the project so all stakeholders are in concurrence. Feasibility analysis and prioritization of the tasks must also be done here.

2.2.2 Elaboration Phase

During this phase prototyping must demonstrate the architecture's feasibility and stability. Risks and plans to minimize risk must also be assessed and developed in this phase. Additionally an appropriate development schedule should be created. Furthermore, cost estimates must also be conceived here. Moreover, an operational impact analysis must be completed to observe how useful the proposed would be to the customer and user.

3. Responsibilities (Who? Where?)

3.1 Stakeholder Responsibilities

3.1.1 Stakeholder Representatives

3.2 Development Responsibilities: Focus on 577b

3.2.1 Development Org. Charts

3.2.2 Staffing

3.2.3 Training

- Internal**

- External**

3.1 Stakeholder responsibilities during the software life cycle

	Inception	Elaboration	Construction	Transition
Users	Users role and functions subsumed by Clients	Users role and functions subsumed by Clients.	(if any user is available else subsumed by Clients) Review and test the system (or its increment) in development environment. Provide feedback about the said system output and performance.	Review and test the system (or its increment) in operational environment. Provide usage feedback to Maintainer
Clients	Clients, Winsor Brown and Keun Lee impart knowledge of Opportunity Tree, eBASE and DR, Support definition and review of requirements specification, operational concept and plan – accept or reject options	Winsor Brown monitors progress at milestones, review designs, prototypes, plans and feasibility during ARB, help refine Opportunity Tree knowledge, provide alternative/enhanced concepts, Keun Lee provides empirical information	Mentioned clients monitor progress at milestones. Review and test the system by means of usage. Review the system performance. Keun Lee provides empirical information	Named clients Monitor progress Review system performance of the system and its capability when deployed in real world environment.



4. Approach (How?)

4.1 Monitoring and Control

4.1.1 Closed loop feedback control

4.1.2 Reviews

4.1.3 Status Reporting

4.1.4 Risk Monitoring and Control

4.2 Methods, Tools, and Facilities

4.3 Configuration Management

4.4 Quality Assurance

4.1.1 Risk Management

Risks always impact schedule and resources (which is what the LCP is about), so:

- Identify major sources of risk in the software development project, and show how the project will address, monitor, and resolve these sources of risk.
- System Priorities (FRD 3.1) identified optional requirements that can be left out in the case of schedule slippage
- Indicate impact of risk management on schedule and resources (e.g. alternatives, options, etc.)

4.1.1 Risk Management (continued)

- For every critical risk, you can indicate:
 - Description
 - Potential Damage to schedule and stakeholders
 - Actions to Mitigate Risk
 - Contingency Plan
 - Change in Status
- Different point of view from FRD
 - Risk assessment and feasibility of mitigation approach
 - (later in FRD) Risk Exposure = (Probability of unsatisfactory outcome) x (Loss if unsatisfactory outcome)
 - Rationale for why risk is managed the way it is

Example Risk Management

Risk Items	Weekly Ranking			Risk Resolution Progress
	Current	Previous	# Weeks	
RI-1 Testing Time	1	2	7	Create a comprehensive set of test cases. Ensure that high risk items are thoroughly tested first.
RI-2 Lack of Performance Requirements	2	4	7	Stress testing will be performed on a “risk-driven” basis.
RI-3 Divergence of Code from SSAD Design	3	1	3	Developers and architect will work closely to review code and design.
RI-4 CS577a Deployment Plan	4	3	7	Work with customer to identify major deployment issues.

RI-1 Testing Time	
Objectives:	Due to time constraints, test system on a risk-driven basis.
Deliverables and Milestones:	Develop test plans and perform testing before final deliverable date.
Responsibilities and Organization:	CS577b team and users will be responsible for this risk.
Approach:	Coordination needed between developers and testers.
Resources:	No budget, 24-week schedule, CS577b developers, testers



Top-N Risk Item List

(Assuming weekly risk reassessment)

Risk Items	Weekly Ranking			Risk Resolution Progress
	Current	Previous	# Weeks	

4.1.3 Status Monitoring and Control

- Describe techniques, procedures, and reports to be used in tracking project progress vs. plans and expenditures vs. budgets. Include, as appropriate:
 - Summary Task Planning Sheets;
 - Earned Value Status Reports
 - Project Expenditure Summaries;
 - Cumulative Milestone Progress Reports;
 - PERT/ COST Systems;
 - Budget-Schedule-Milestone Charts;
 - Personnel Loading Charts;
 - Detailed Expenditure vs. Budget Reports.



4.3 Configuration Management

4.3.1 Product Identification

- Systematically Identify Each Product Component
 - Types, Hierarchy, Media, Versions

4.3.2 Configuration Change Management

- Controlled Mechanism for Product Changes
 - Forms, Procedures, Approval Authority

4.3.3 Project Library Management

- Controlled Product Storage & Distribution

4.3.4 Configuration Status Management

- Keep Accurate Track of Product Status
 - Forms, Logs, Files, Reports

Configuration Management

Review, Baseline

Option Exploration

- Easy Changes
- Fluid Products
- Emphasis on Flexibility



Configuration Management

- Coordinated Changes
- Carefully Defined Products
- Emphasis on Control

4.4 Quality Assurance Functions

- **Documentation and Code Standards**
- **Standards Compliance Monitoring**
- **Plans & Policies Compliance Monitoring**
- **Review & Test Monitoring**
- **Corrective Action Monitoring**
- **Verification and Validation**
- * **QA is everyone's job**
 - but people need reminders



5. Resources

5.1 Work Breakdown Structure (WBS)

5.2 Budgets

5.1 Work Breakdown Structure (WBS)

- **Defines Project Jobs to be Done**
- **Associates Budgets With Work Packages**
- **Serves as Basis for Cost-vs.-Progress Monitoring and Control**

- **Tailor and refine WBS, DO NOT JUST COPY IT INTO YOUR DOCUMENT!**



5.2 Budgets

The cost (in USD) involved in various phases of the project is summarized below:

Engineering phase:

CS577a development cost	60hrs/week
Cost for CSE Client representative's time	2hrs/week
Wage for TRS & Hyperwave Consultant/Expert	2hrs/week

Construction phase:

CS577b development cost	60hrs/week
Cost for CSE Client representative's time	2hrs/week
Wage for TRS & Hyperwave Consultant/Expert	2hrs/week

Transition phase (2 weeks):

CS577b development cost	60hrs/week
Cost for CSE Client representative's time	2hrs/week
Wage for TRS & Hyperwave Consultant/Expert	2hrs/week
System Administrator	5hrs/week (approximately)
Testing and Data Ingestion	10hrs/week (approximately)

Example 5.1 WBS

A Management

AA Inception phase management (Gustavo Perez)

AAA Top-level Life Cycle Plan - LCP 1.0 (Purnachandra Sharma)

AAB Inception phase project control and status assessments

AAC Inception phase stakeholder coordination

AAD Elaboration phase commitment package and review (LCO package preparation and ARB review) (Team 19, Prof. Dan Port, Dr. Barry Boehm)

AB Elaboration phase management (Apurva Jain)

ABA Updated LCP with detailed construction plan – LCP 2.0 (Gustavo Perez)

ABB Elaboration phase project control and status assessments

ABC Elaboration phase stakeholder coordination

ABD Construction phase commitment package and review (LCA package preparation and ARB review)) (Team 19, Prof. Dan Port, Dr. Barry Boehm)

AC Construction phase management (Apurva Jain)

ACA Updated LCP with detailed transition and evolution plans (Gustavo Perez)

ACB Construction phase project control and status assessments

ACC Construction phase stakeholder coordination

ACD Transition phase commitment package and review (IOC package preparation and PRB review)

AD Transition phase management (Apurva Jain)

ADA Updated LCP with detailed next-generation planning (Gustavo Perez)

ADB Transition phase project control and status assessments

ADC Transition phase stakeholder coordination

ADD Evolution stage commitment package and review (PR package preparation and PRB review) (Team 19, Prof. Dan Port, Dr. Barry Boehm)